Uncovering the Nature of Platform-based Business Models: An Empirical Taxonomy

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Abstract

Digital platforms increasingly determine the 21st century business world. This is especially reflected in the development of multi-sided platforms such as Airbnb or Uber that depict the centerpiece of innovative business models as they effectively match demand-side and supply-side participants through advanced technologies. Such marketplace platforms substantially contribute to an emergence of new ecosystems. However, we do by now not know much about the characteristics of the underlying innovative business models. To close the gap, this research develops a conceptually and empirically grounded taxonomy of marketplace business models. The paper is based on a dataset of 100 marketplace firms and presents an analysis of the business models of these firms based on different cluster analysis techniques. As a result, basic types of marketplace business models are identified and characterized. The paper contributes to a better understanding of platform-based business models and opens several avenues for studying their interplay with ecosystems.

1. Introduction

Since the inception of eBay in 1995, business and information systems (IS) scholars have been interested in the characteristics of IS-mediated marketplaces. Applying a business perspective, we conceptualize such marketplaces as firms that provide a technological platform to match a demand and supply side for a good or service by technologically facilitating direct transactions between them. IS-mediated marketplaces are a specific form of multi-sided platforms (or two-sided markets) that enable commercial transactions between participants [1]. Firms using multi-sided platforms are, among others, characterized by blurry organizational boundaries [2] and a strong impact on the entire business ecosystem [3]. Strategy scholars have been interested in these businesses for their ability to reduce transaction costs between market actors, their ability to rapidly scale and dominate a market, and their large profit potential [4]. In its essence, marketplaces are attractive configurations of digital business models with strong network effects that drive high-margin growth [5].

With recent technological advances in search and matching algorithms, social network-integrated trust mechanisms, review and pricing functionalities, and the diffusion of mobile devices, marketplace platforms can offer an increasing variety of value propositions. Popular marketplaces such as Airbnb or Uber have shown how IS-mediated platforms can lead to entirely new business models. These innovative business models have gathered attention due to their potential to disrupt established industries [2]. Following the success of marketplaces such as Airbnb and Uber, last years have seen the emergence of a large number of marketplace start-ups, ranging from online learning and counseling services, to dog sitting or food delivery. This research therefore focuses particularly on the marketplace business models of start-ups.

To date, literature on IS-mediated marketplaces is dispersed and often remains anecdotal. In particular, there is little knowledge about the characteristics of different types of marketplace business models. While a lot of start-ups are claiming to build the next »eBay for X« or »Airbnb for Y«, it remains unclear how these role models that are to be copied really work. Consequently, there is great need for new empirical research concerning the business models of digital marketplaces. To address this need, the paper focuses on the questions: what are the business model types for marketplace platforms? What elements characterize these types? To answer these questions, we first review the literature on business models, marketplaces, and multi-sided platforms to identify the key elements of these business models. We use the identified variables to systematically code and analyze the business models of 100 randomly identified marketplace start-ups. Using cluster analysis, we aim at developing a taxonomy of marketplace business model types that allows for systematically capturing their elements and characteristics. Our analysis provides an empirically

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grounded taxonomy and characterization of marketplace business models. We enhance business model and platform literature as we shed light on one of the most prominent types of innovative business models that has become the epicenter of newly emerging business ecosystems.

2. Business models of digital marketplaces

While digital marketplaces are insufficiently defined, we can identify four defining conditions for classifying a firm as a digital marketplace. First, digital marketplaces connect independent actors from a demand and supply side (individuals or organizations) via a digital platform [6]. Individual actors can, however, participate in the market on both, the supply side and the demand side, and are therefore not necessarily different groups of individuals. Second, these actors enter direct interactions with each other to initiate and realize commercial transactions. These interactions go beyond the highly automated processes in electronic commodity trading or stock markets. Third, the platform provides an institutional and regulatory frame for transactions. This criterion excludes internet portals that offer algorithmic aggregation of different marketplaces [7]. Fourth, the platform does not substantially produce or trade goods or services itself. This condition excludes business models of producers or retailers that additionally allow other parties to offer goods via their digital platform [1]. Digital marketplaces in the sense of this study therefore differ from the conceptualizations of electronic markets through the focus on the marketplace as a business rather than an institutional or technological phenomenon. While the concept of marketplaces exists for centuries, this research focuses on marketplace platforms that are enabled by technological advances such as sophisticated searching or matching algorithms, and therefore generally only emerged in the 21st century.

Analyzing the business models of marketplaces requires an understanding of the business model as unit of analysis. The business model (BM) concept can be distinguished from other units of analysis – such as strategy – by its systemic focus on value creation and capture [8]. This understanding follows the definition by Teece [9] who describes business models as *"the design or architecture of the value creation, delivery and capture mechanisms employed. The essence of a business model is that it crystallizes customer needs and their ability to pay, defines the manner by which the business enterprise responds to and delivers value to customers, entices customers to pay for value, and converts those payments to profit through the proper design and operation of the various elements of the value chain"*. In line with this description, researchers very often refer to the distinctive business model dimensions value creation, value capture and customer dimension [10].

While business model research has not converged towards a common definition, it increasingly recognizes some common characteristics such as the holistic perspective and the boundary-spanning nature of business models [11]. A large share of business model literature represents business models through a set of generic elements and their potential specifications [12–16]. This paper considers only those elements that seem to be of high relevance in the realm of marketplaces. The selection of elements follows the design principles of morphological analysis. Morphological analysis has been identified as a suitable methodology to gain a holistic understanding of the relevant attributes (elements) and specifications of an object of interest within a specific context. The resulting morphological box can also serve as an artefact to identify innovative business models through new configuration of the attributes' specifications [17]. The process of morphological analysis follows an iterative process of reviewing the literature on business models, platforms and marketplaces, exploratory expert interviews, and its evaluation through coding of sample firms and confirmatory expert interviews. Table 1 gives an overview of the selected business model attributes that are derived from a review of the literature on business models, platforms and marketplaces. The first six attributes are part of the customer dimension (value proposition, delivery channels and platform type), the subsequent four are part of the value creation model (key resources and activities), and the final four represent the value capture dimension (revenue and pricing model).

The customer dimension contains the elements that generate value (utility) for a group of defined target customers. To empirically categorize the value proposition, the framework distinguishes between three types of perceived value: (a) utilitarian value through price, cost, or efficiency advantages, (b) emotional value through superior user experience or the associated image with using the marketplace and (c) social value through the interaction with other marketplace participants. The delivered value further depends on the transaction type (digital vs. offline) and transaction content (product vs. service) [18]. The combination of these two attributes defines whether the marketplace offers physical products (e.g. used household products), digital products (e.g. digital music), online services (e.g., online tutoring), or offline services (e.g. transportation services). For

marketplaces, the dimension further contains whether the marketplace provides vertical or horizontal market integration [19], the geographic scope (options derived from [22]), and the type of user segments that the marketplace primarily connects as participants (C2C, B2C, B2B).

Table 1. Key business model attributes of marketplace platforms

Business Model attributes	**Specifications**				
Customer dimension					
Key value proposition	Price/Cost/ Efficiency	Emotional value	Social value		
Transaction content	Product	Service			
Transaction type	Digital	Offline			
Industry scope	Vertical	Horizontal			
Marketplace participants	C2C	B2C	B2B		
Geographic scope	Global	Regional	Local		
Value creation dimension					
Platform type	Pure web-based platform	Mobile app			
Key activity	Data services	Community building	Content creation		
Price discovery	Fixed	Set by sellers	Set by buyers	Nego-tiation	Auc-tion
Review system	User reviews	Review by platform	None		
Value capture dimension					
Key revenue stream	Commi-ssions	Subscri ptions	Adver-tising	Service Sales	
Pricing mechanism	Fixed pricing	Market pricing	Differentia-ted pricing		
Price discrimination	Feature based	Location based	Quantity based	None / other	
Revenue source	Seller	Buyer	Third party	None/ other	

The value creation dimension refers to the mechanisms that eventually allow delivering value to customers. They are expressed in the firm's orchestration of resources, and processes [20]. For digital marketplaces, relevant business model attributes relate primarily to the core functions of marketplaces as identified by [6]: trust creation (e.g. user review systems) [21] and support for the discovery of an acceptable price between (potential) transaction partners [6]. Price discovery mechanisms can build on a pricing system in which (a) the platform provider, (b) the supply side or (c) the demand side sets the price. Alternatively, the price discovery can result from competitive pricing mechanisms such as an auction system [6]. Further, the framework includes the main type of platform technology (purely web-based or mobile app) as well as the firm's key activity (data services, community building, or content creation & curation). The value capture dimension or profit formula describes how the firm transforms the value delivered to customers into revenues and profits [9, 20]. For marketplaces, revenue stream options can be distinguished between commission model, subscription model, advertising model and service sales (based on [22]). The pricing model is characterized by fixed pricing, market pricing and differentiated pricing as well as the basis for discriminating between different user groups (e.g. feature-based for premium services) (options derived from [14]). For marketplaces, the business model is further defined by the decision to monetize supply-side participants, demand-side participants, or a third party [2]. Since we focus on start-ups, we further include the option 'none' if the firm has not yet started to monetize its services.

3. Methodology

The research aims at analyzing the business models of start-ups building digital marketplace platforms. Our understanding of 'start-ups' is not restricted to a certain firm size, but encompasses all private firms that aim at rapid growth. These firms are suitable for analyzing business model elements, firm clustering and taxonomy development since they only apply one business model per firm. In contrast, larger corporations often manage a portfolio of several business models [23]. The sampling methodology follows the approach by Hartmann et al. [24]. Companies are drawn from the database AngelList (www.angellist.com/ marketplaces), a network which was created to simplify matchmaking between investors and start-ups. The database provides start-ups with the possibility to create a profile on its website to increase its visibility to investors, potential employees and other interested persons. Our sample of firms consists of those start-ups that are categorized as 'marketplaces' on the AngelList database (more than 4,500 of all start-ups are tagged as 'marketplace'). We randomize the list of marketplace start-ups using the service random.org, which generates randomness via atmospheric noise. The first 100 firms from the randomized list are selected as the study sample. Within the process of analyzing the firms, we had to exclude a total of 69 firms which did not meet the

applied definition of marketplaces (e.g. retailer) or did not provide sufficient information for a larger number of the defined business model attributes. For every exclusion, the subsequent firm from the randomized list is added to the sample.

Obtaining reliable data for new venture firms is difficult. The developed framework and the questions require some knowledge about the underlying definitions to allow for consistency within the dataset. Therefore, we decided to collect data ourselves based on secondary sources. This approach follows prior empirical research on business models [25]. Data is selected from the firm's websites, start-up focused databases, as well as online articles of newspapers and journals. If the business model changed over time, we used the most up-to-date information and did not consider a previous business model. Prior research has shown that this methodology is valid for analyzing business models of start-ups [24]. In total, we identified and analyzed 460 different documents.

The classification process of this paper follows the approach for business model classification by Lambert [26]. Based on that process, we employed a numerical taxonomic approach. A taxonomy describes an empirically derived classification that is based on a large number of observable characteristics rather than one or two dimensions. It aims at forming objects that share a large number of characteristics as opposed to classification on one single characteristic [27]. Hence, to identify and understand the different types of business models, the classification approach should use a set of variables that is not completely selected ex ante by the researcher. This is specifically necessary when relevant literature is scarce [28].

To systematically analyze the business models from the collected data, we conducted a content analysis and codified the observations with regard to the selected variables (described in the previous section). We represented each of the specifications from table 1 as a binary variable and assessed whether the specific business model specification is part of the respective firm. The coders manually examined the identified documents for statements regarding particular attributes of the framework. We used the qualitative content analysis software MaxQDA 11 for the documentation of the coding process and the retrieval of codings afterwards. Two researchers knowledgeable about the topics independently coded the documents. While specifications for most attributes are mutually exclusive and unambiguous, it was not always possible to determine the key value proposition and key activity. In these cases, we coded each specification independently, which led for some firms to none or more than one positively coded variable for the attribute. After coding all documents about a marketplace firm, we reviewed the information for the categories. If there was information missing about a variable, the existing documents were specifically scanned for such information and – if necessary – supplemented by additional sources. During the coding process we had to remove some variables that did not allow for gathering reliable data points (these are not shown in table 1). The output of the coding process is a database of business model-related text passages and the binary variable values for 100 marketplace firms.

To develop the numerical taxonomy, we analyzed the hand-collected data with different cluster analysis techniques. Cluster analysis aims at discovering distribution patterns and identifying interesting correlations among data attributes. The methodology also supports discovering ideal types of a similar group of objects [29]. First, we conducted a cluster analysis to identify the number of clusters (i.e. business model types). Following [29], we used hierarchical clustering (agglomerative hierarchical clustering) as well as visual examination of the dendrogram to determine the number of clusters. The agglomerative hierarchical clustering analysis included an initial set of 82 binary variables (some variables have been eliminated afterwards due to poor discriminatory power or variable relevance). We chose a method that aims at maximizing the homogeneity within the clusters, applying an Euclidian scale to measure the distance.

To identify the six clusters, we followed the recommendation by [29] and apply a nonhierarchical clustering process. Nonhierarchical clustering partitions a data set into a predefined number of clusters, aiming at generating optimized solutions. Contrary to the hierarchical methods, clusters are rearranged during the process. We used the nonhierarchical method of k-means that partitions the n observations into k clusters in which each observation belongs to the cluster with the nearest mean. The center of each of the k clusters can subsequently be interpreted as an ideal type of the cluster. To discover and select the limited set of variables for k-means clustering, we combined an analytical with an experimental approach. Researchers should select only those variables for clustering that are believed to help determine the underlying clustering in the data [30]. Based on the predefined number of clusters and the selected variables, we then conducted a partitioning k-means cluster analysis.

4. Sample characteristics and key clustering variables

The 100 firms are equally distributed over several industries with the largest shares in hospitality (13%), delivery and professional services (12%), industrial goods (11%), consumer goods (10%), and education (9%). Most of the firms were founded between 2010 and 2013, with only 15 firms founded before 2010 and 13 founded after 2013. The sample contains an almost equal amount of marketplaces for physical products (28), physical services (28) and digital services (30), with a high share of offline services founded after the year 2010. In comparison, marketplaces for digital goods represent a small group, with the oldest digital good platform founded in 2011.

The key value proposition of the marketplaces is relatively concentrated: 75% of the firms in the sample provide value through increased efficiency or cost savings. Regarding the customer type, only eight marketplaces match businesses with each other (B2B). This is in line with our definition of digital marketplaces that excludes highly automated and standardized commodity trading (e.g. stock markets). The majority of sample firms (60%) match individual buyers and sellers with each other (C2C). In half of these C2C marketplaces, customer segments can overlap; a customer can simultaneously act as seller and buyer. One third of marketplaces match businesses with consumers (B2C).

The variables from the value capture dimension show that 72% of marketplaces generate revenues from commission fees. Another 22% generate subscription fees, while listing/bidding fees (3%) and advertising (2%) are the exception. Ten of the sample firms combine a commission fee with a subscription or listing/bidding fee. Yet, 9% of the analyzed firms have no visible revenue streams at this point. Breaking down the revenue stream by user segment, commissions are the primary option for C2C (79%) and B2C (70%) marketplaces. B2B marketplaces focus less on commissions (33%) and focus more on subscriptions (66%). While these descriptive statistics are not statistically significant, they serve as an indication for the population of marketplaces in general.

Regarding the value creation elements, the majority of firms provide some form of review system. The data suggests that a review system is much more common in service marketplaces (74%) than in product marketplaces (40%). In around 80% of the cases, the review system allows only the buyer side to assess the seller side. Reviews by the marketplace provider (14%) are rather the exception. Marketplaces generally create value by supporting the price selection process. In 68% of the sample firms the seller side is responsible for price setting. In the remaining marketplaces, the platform provider determines the price in 15 cases, the price is determined through negotiation (8), an auction (7), and / or buyers determine the price (4).

The first clustering phase and conceptual considerations have revealed the key variables for the further clustering process. These variables are based on the specifications for five different business model attributes presented in table 1: (1) transaction content (product; service), (2) transaction type (digital; offline), (3) marketplace participants (C2C; B2C; B2B), (4) key activity (community building), and (5) revenue source (buyers; suppliers). It is noteworthy that we focus only on specifications that seem to provide high discriminatory power and that allow some form of interpretation. While some firms did neither monetize buyers or sellers, it was in some cases not clear whether they generated revenues from a third party (e.g. advertisers) or had no significant revenue source at all. Also, for the attribute of 'key activity', the specification of 'community building' proved to provide a high reliability in the coding process as well as a good discriminatory power. Since the specification contains the information whether the firm focuses on building an active community of users, the variable was consistently assessed by studying the platform's social network functions. For the specifications of transaction content, transaction type and marketplace participants, only the dominant option was chosen. Hence, these attributes can each be considered as one independent variable instead of two or three. In total, the iterative clustering process allowed identifying 6 independent variables.

5. Taxonomy of marketplace business models

The attributes identified with strong discriminatory power are subsequently used to determine the clusters. The clustering process reveals six clearly distinguishable clusters. Table 2 lists the cluster centers for each of them in regards to the selected attributes. Each of the 100 firms belongs to one of the clusters, with only eight of them showing a distance higher than 1.3 from the cluster center.

We can primarily characterize the six clusters by analyzing their technical centers. It becomes apparent that there is an even split between product-focused and service-focused business models. Two clusters

focus on digitally delivered transactions, while four clusters contain marketplaces for products that are delivered physically. As a consequence, each cluster can clearly be related to one type of transaction content: 1 and 3 center on physical products, cluster 2 focuses on transactions of digital products, 4 and 6 on offline services and 5 on online services.

Table 2. Technical cluster centers of k-means analysis

	Cluster	1	2	3	4	5	6
	# of firms	11	12	12	12	28	25
Transaction content	Service	0	0	0	1	1	1
	Product	1	1	1	0	0	0
Transaction type	Digital	0	1	0	0	1	0
	Offline	1	0	1	1	0	1
Marketplace participants	B2B	0	0	0	0	0	0
	B2C	0	0	1	1	0	0
	C2C	1	1	0	0	1	1
Key activity	Community building	0	1	1	0	1	0
Revenue source	Supplier	1	0	1	1	1	1
	Buyer	0	0	0	0	0	0

The variable *marketplace participants* also contributes strongly to the cluster formation. Interestingly, all cluster centers are either located on B2C (3 & 4) or C2C transactions. These technical cluster centers give a good idea of the general characteristics of firms in the cluster. Nevertheless, this does not mean that all firms of the cluster fulfill the particular attribute. To reveal the core differences between the six clusters, figure 2 represents them as a matrix with the combined transaction content and type on one axis and the type of marketplace participants on the other axis. In the representation, the technical center of each cluster is displayed with one color. The shadow of the same color represents the spread of different forms in that cluster. For instance, cluster five technically represents C2C online services. However, the cluster also contains firms that provide online services for B2C and B2B customers. It becomes apparent that clusters 1, 2 and 3 partly overlap regarding these two dimensions.

The key activity of community building is another variable with important impact on the cluster formation. Contrary to the remaining four clusters, the large majority of firms in cluster 2 & 3 strongly focus on community-building activities. Surprisingly, the clustering process did not use the revenue source as a discriminator. Here, all but cluster 2 center around the same option: only the seller pays for the service. While the center of cluster 2 suggests that firms in this cluster do not charge any market side, the detailed analysis reveals that these firms are evenly spread between several revenue sources (including third parties). In fact, only one firm in cluster 2 does not monetize at all.

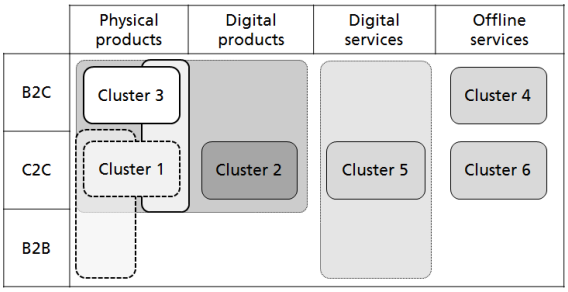

Figure 2. Clusters plotted against transaction type & transaction content (combined) and marketplace participants

To interpret the six clusters, we analyze the characteristics of each business model type quantitatively by analyzing the marketplace firms included in the corresponding cluster. The descriptive statistics are provided as an average of all firms in the cluster. For instance, in cluster 1, 91% of firms offer the key value proposition of a price, cost or efficiency advantage and 100% of firms offer physical goods. All percentage values are rounded; therefore, they do not necessarily add up to 100%. Please note that the quantitative data on the percentage distribution of the business model attributes is only indicative but not statistically significant given the small sample size.

Cluster 1 consists of marketplaces for physical products. Two thirds of the firms facilitate transactions between individuals (C2C), while one third facilitates transactions between businesses. The majority (64%) of the marketplaces in this cluster exchange industrial goods. Therefore, these marketplaces often aim at standardizing and commoditizing products to facilitate search and negotiation. For the individual sellers, the platform offers access to a large market of potential buyers. The statistics depict that for 91% of the sample firms in this cluster customers use the platform primarily for superior efficiency and prices. Almost 90% of the firms charge the seller side, including 13% that charge both sellers and buyers with a fee. Two thirds of firms generate revenues from commissions; one fourth also generates revenues from subscriptions. These subscriptions are often charged to the seller side for additional services, increased visibility or access to customer data. In particular, all subscription models are offered with different price options in relation to the included service features. Regarding the review system, sellers are assessed by the buyers

(45%) or the marketplace provider itself (27%). An example for a firm in this cluster is *Beepi*, a start-up offering a digital marketplace for used cars. Based on the cluster characteristics, we label the related business model type as 'efficient product transactions'.

The second cluster contains platforms that primarily build a community around products. It contains 100% of digital product marketplaces which represent two thirds of the cluster's firms. The remaining third are physical product exchanges. The marketplace primarily creates value to users by developing an active community of like-minded people (67%). Therefore, the related BM type can be described as 'digital product community'. Firms in this cluster focus on community building (75%). While most of the transactions take place between individuals (83%), 17% of the cluster firms apply a B2C model. One third of the firms receive revenues from the seller side, 25% from the buyer side, 17% from both, 17% from a third party and 8% offer the service for free to both sides. Among revenue streams, commission fees are the dominant revenue form (69%). If fees are differentiated, differentiation is most likely based on quantity. Two thirds of the marketplaces in this cluster only focus on one industry. This cluster has the highest share of globally operating marketplaces. This is not surprising since platforms with digital products can expand to a global market relatively easy. Interestingly, this cluster contains the highest share of marketplaces in which buyers can set prices. Based on its dominant variable, we label the cluster 'product community'. An exemplary firm for the cluster is the self-publishing platform *Sellfy*. *Sellfy* that enables creators of a variety of digital content – from e-books, music, videos to software – to commercialize their content via the platform. The platform has built a community of independent authors, musicians and designers that maintain active social network profiles on the site and interact directly with buyers.

The third cluster consists entirely of marketplaces that facilitate the exchange of physical products. Two thirds of the firms focus on B2C, one third on B2C transactions. A large share of marketplaces in this cluster creates emotional value through the image of the platform (67%). Also, the community aspect of these business models is much higher than in cluster 1 – the other cluster of physical products. On the other hand, efficiency and price advantages have the lowest importance among all clusters (42%). As for cluster 2, these BMs strongly focus on community building as a key activity (58%). All firms charge the seller side; either with a commission (77%) and/or subscription model (15%). Sellers set fixed prices for the products they sell (85%), but have to accept fixed fees from the marketplace. Firms in the cluster tend to apply a vertical model to concentrate on one distinctive product category (67%). With the exception of one firm, they either operate in one individual country (42%) or are globally active (50%). While start-ups in this cluster focus the least on data-activities (17%), they are the most active cluster in creating and curating the product listings. We label the cluster as 'product aficionados' since firms using this BM type tend to build a community of people with a shared passion for a certain product type. Such users are drawn to the community to discuss these products and inform themselves. Examples include aficionados of independent art products (*artsy*), handmade design (*solidarum*), educational products (*educents*), independent music (*merchbar*), or collectibles (*hobbyDB*).

Cluster 4 comprises marketplaces that match service firms with consumers.The exchanged services are delivered through offline channels and therefore require some form of scheduling. The primary value for both the businesses selling the services and the consumers demanding them can be related to their efficiency gains (83%). Consequently, these firms focus their activities on generating data services (75%) to increase efficiency. Within the cluster, companies can be subdivided into two groups. A first group contains firms that act as aggregators for services that require exact time reservations. Examples include hairdressers (*styleseat*), car rides (*technorides*), or touristic activities (*gidsy*, *headout*). The second group of firms offers services that are therefore less time-sensitive, but equally require capacity management. Examples include services for shipping (*shyp*), alcohol delivery (*drizly*) or construction work (*buildzoom*). In both groups, providers have limited capacity and therefore benefit from the scheduling process provided by the marketplace. The applied business models in this cluster are further characterized by the communication channel of a mobile apps (58%). In terms of the revenue model (main revenue stream and source), the firms primarily charge a commission fee from sellers (73%), while buyers mostly use the marketplace for free. The business models of most of those firms (75%) operate in a narrow customer segment (one industry), which is in 67% of cases limited to one country. In the cluster, the price discovery mechanism mostly builds on sellers setting a price (67%). The cluster has the highest percentage of firms that provide reviews of sellers. Based on its time-sensitive nature, we label the business model as 'on-demand offline services'.

Cluster 5 represents the largest cluster, containing 28% of firms from the entire sample. Firms in the fifth cluster share the characteristic that they offer services that are delivered via the internet. This typically includes individuals sharing their skills through online language tutoring (*italki*), teaching classes (*skillshare*), or video-based online courses (*udemy*). The cluster also includes marketplaces for professional freelancers such as divorce attorneys (*wevorce, breakthrough*), municipal financial investors (*neighborly*), designers (*visually*), or scientific researchers (*experiment*). These marketplaces offer the value position of additional income (for sellers) and efficient access to services (for buyers). In many cases, the users also perceive a value from the active community around the core service. In 75% of cluster firms, the value proposition is targeted at one single industry (vertical) and more than half of these marketplaces operate only in one country. Since some of the services are rather standardized, the share of marketplaces setting a fixed price is the highest among all clusters (21%). Only 25% of the marketplaces offer an app. The marketplaces of this cluster monetize by charging sellers (68%), and/or buyers (20%). The fee is mostly charged as commission (55%) or subscription (28%). Nearly half of the firms offer differentiated fees. Due to the common denominator of the cluster firms, the related BM type is labeled 'online services'.

With one fourth of firms assigned to cluster 6, it represents the second-largest cluster in the sample. The cluster is characterized by peer-to-peer exchange of offline services. Thus, the related BM type can be described as 'Peer-to-peer offline services'. Firms in this cluster can be further divided into two sub-types: (a) individuals sharing their physical resources and (b) individuals providing their time and skills. Resource sharing firms include shared private accommodation (*Airbnb*), office space (*sharedesk*), or cars (*getaround*). Time- and skill-sharing services comprise pet sitting (*spotwag*), delivery services (*postmates*), or event organization (*honeybook*). As in cluster 5, these firms provide a novel source of income for the supply side and create value to the buyer side through an increase in transaction efficiency (88%) and a positive platform image (28%). The companies in this cluster mostly apply vertical business models (80%) and are only active in one country (80%). Prices are set mainly by the seller side (73%), while sometimes the platform determines a standard price (17%). 72% of the firms in this cluster provide a review system to generate trust between the users. The revenue streams are predominantly generated from commission fees (80%), with 60% of platforms determining a fixed fee. More than half of the firms generate revenue from the seller side (55%), but the share of firms that charge buyers is highest among all clusters (30%).

The descriptive analysis of the clusters has revealed interesting differences that allow interpreting the clusters. Cluster 1 and 3 both facilitate the commercial exchange of physical products. However, they are fundamentally different in their value proposition: cluster 1 provides superior efficiency and financial advantages, while cluster 3 – product aficionados – provides a social function in which members become primarily part of a community of like-minded people interested in a particular product type. Cluster 4 and 6 both match supply and demand of offline services, but the supply-side logic of the business models is completely different. Marketplaces in cluster 4 can be interpreted as a novel and more efficient sales and marketing channel for businesses with limited capacity. In contrast, firms in cluster 6 develop crowd-based business models that allow creating entirely new markets.

6. Discussion of results

The study of platform-based business models allows novel insights for researchers and platform managers. Most importantly, it becomes apparent that talking about a 'platform business model' or 'marketplace business model' does not account for the variety of these business models. This can potentially deceive managers in their decision making processes. For instance, it becomes apparent that a business model build around on-demand offline services (type 4) requires different strategic decisions and technological requirements than a business model build around a social community (type 2). Researchers need to take these differences into account when deriving managerial implications from studying a specific type of platform businesses.

The research process revealed several qualitative insights into the nature of platform-based business models. From an organizational perspective, we recognize the dynamic nature of these business models. Many of these start-ups had already changed their business model within the first years of existence. The coding data suggest that these changes are linked to some key events in the start-ups' timeline such as achieving a critical mass of participants on the platform. In particular, changes regarding the revenue and pricing model seem to follow certain dynamic patterns.

Second, we recognize some correlation between the business models of the start-ups and their geographic locations. For instance, many of the

service-centered marketplaces are based in the San Francisco Bay Area (California). This suggests that certain environmental factors might act as contingencies for the suitability of one business model type or another. In the case of 'on-demand offline services' this might relate to the proportion of early technology adopters, the level of high-speed internet coverage, or the availability of venture capital. Besides, the recent legal battles of Airbnb and other offline services in countries like Germany have shown how the legal environment can play an important role in enabling or blocking the suitability of certain business models.

Third, we recognize some correlations between the start-up's founding year and the chosen business model. This could, for instance, suggest that influential stakeholders such as venture capitalists develop (temporary) business model preferences when selecting and advising start-ups. Future research could include firm characteristics, environmental contingencies, and 'business model trends' when studying performance differences between platform-based business models.

Lastly, the coding process revealed the differences in the business models' innovativeness. The recent discussion on platform-based business models is often driven by a technology-optimistic view that links these business models to a high degree of disruptive potential. Some of the business models like Airbnb have shown to significantly change their industries. The majority of the identified firms, however, does not necessarily create new or enlarge existing markets despite a novel business model configuration. We suggest that in the context of platforms, the innovativeness of business model might depend on the degree to which it creates a new or changes an existing ecosystem. For instance, some of the B2C marketplaces did create new business ecosystems after sustainably aggregating a large network of customers with common interests. For instance, the marketplace *HobbyDB* has become a major sales and marketing channel for a variety of small businesses offering collectibles. Consequently, the interplay between a platform and its ecosystem might offer new insights into the innovativeness of a business model and can therefore offer a rewarding perspective for the respective research.

7. Conclusions

This paper discusses the business models of digital marketplaces, a highly emerging platform type. Most importantly, it provides a novel taxonomy of their business models. The identified taxonomic clusters suggest that there exist six distinguishable types of marketplace business models: (1) 'efficient product transactions', (2) 'digital product community', (3) 'product aficionados', (4) 'on-demand offline services', (5) online services' and (6) 'peer-to-peer offline services'. The taxonomy contributes to the discussion on platforms by providing a business model perspective that can support a more nuanced study of their technological requirements and performance implications. Further research should study whether the identified types require different strategic approaches and produce substantial performance differences.

The research is not without limitations. The iterative process of identifying suitable clustering variables requires a certain degree of subjective judgement. Different variables might reveal differences within or strong similarities between some of the identified clusters. Most likely, adding or subtracting clustering variables would assign some of the firms to other clusters. While we believe that the developed taxonomy is an important step towards a common frame of reference to think about platform-based business models, we acknowledge that different configurational perspectives could reveal complementary insights about their nature. Besides, the generalizability of the findings might be limited since the study has focused on start-ups and almost all of the identified firms are based in developed countries in North America and Europe. Further research could therefore study whether the taxonomy is robust when applied to incumbent firms transforming their business model towards a marketplace platform or when tested with firms from different legal or technological environments. Besides, the interdependence of the identified business model types and their ecosystems opens important venues for further research.

8. References

[1] Hagiu, A. and J. Wright, "Marketplace or Reseller?", Management Science, 61(1), 2015, pp. 184–203.

[2] Parker, G.G., M. van Alstyne, and S.P. Choudary, Platform revolution: How networked markets are transforming the economy - and how to make them work for you, 2016.

[3] Gawer, A. and M.A. Cusumano, Platform leadership: How Intel, Microsoft, and Cisco drive industry innovation, Harvard Business School Press, Boston, Mass., 2002.

[4] Hagiu, A. and J. Wright, "Do you really want to be an eBay?", Harvard Business Review, 91(3), 2013, pp. 103–108.

[5] Hagiu, A. and H. Alvarez, "Investing in Online Marketplaces", Harvard Business School Case, Boston Mass., 2014.

[6] Bakos, Y., "The emerging role of electronic marketplaces on the internet", Communications of the ACM, 1998.

[7] Parker, G. and M.W. van Alstyne, Platform Strategy, 2015.

[8] Zott, C., R. Amit, and L. Massa, "The Business Model: Recent Developments and Future Research", Journal of Management, 37(4), 2011, pp. 1019–1042.

[9] Teece, D.J., "Business Models, Business Strategy and Innovation", Long Range Planning, 43(2-3), 2010, pp. 172–194.

[10] Zott, C. and R. Amit, "The business model: A theoretically anchored robust construct for strategic analysis", Strategic Organization, 11(4), 2013, pp. 403–411.

[11] Abdelkafi, N. and K. Täuscher, "Business Models for Sustainability From a System Dynamics Perspective", Organization & Environment, 29(1), 2016, pp. 74–96.

[12] Al-Debei, M. and D. Avison, "Developing a unified framework of the business model concept", European Journal of Information Systems, 19(3), 2010, pp. 359–376.

[13] Osterwalder, A. and Y. Pigneur, Business model generation: A handbook for visionaries, game changers, and challengers, 1st edn., Wiley, Hoboken, NJ, 2010.

[14] Osterwalder, A., The Business Model Ontology - A Proposition in a Design Science Approach, Lausanne, Switzerland, 2004.

[15] Hedman, J. and T. Kalling, "The business model concept: Theoretical underpinnings and empirical illustrations", European Journal of Information Systems, 12(1), 2003, pp. 49–59.

[16] Chesbrough, H. and R. Rosenbloom, "The role of business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies", Industrial and Corporate Change, 11(3), 2002, pp. 529–555.

[17] Kley, F., C. Lerch, and D. Dallinger, "New business models for electric cars—A holistic approach", Energy Policy, 39(6), 2011, pp. 3392–3403.

[18] Wirtz, B.W., Business Model Management: Design - Instruments - Success Factors, 2nd edn., Springer Fachmedien Wiesbaden GmbH, Wiesbaden, 2015.

[19] Dai, Q. and R. Kauffman, "Business models for internet-based E-procurement systems and B2B electronic markets: An exploratory assessment", Proceedings of the Hawaii International Conference on System Sciences, 2001, p. 158.

[20] Johnson, M.W., C.M. Christensen, and H. Kagermann, "Reinventing your business model", Harvard Business Review, 86(12), 2008, pp. 50–59.

[21] Pavlou, P.A. and A. Dimoka, "The nature and role of feedback text comments in online marketplaces: Implications for trust building, price premiums and seller differentiation", Information Systems Research, 17(4), 2006, pp. 392–414.

[22] Schlie, E., J. Rheinboldt, and N.M. Waesche, Simply seven: Seven ways to create to sustainable internet business, Palgrave Macmillan, Houndmills, Basingstoke, 2011.

[23] Sabatier, V., V. Mangematin, and T. Roussell, From business model to business model portfolio in the European biopharmaceutical industry.

[24] Hartmann, P.M., M. Zaki, N. Feldmann, and A. Neely, Big Data for Big Business? A Taxonomy of Data-driven Business Models used by Start-up Firms, Cambridge, UK, 2014.

[25] Zott, C. and R. Amit, "The fit between product market strategy and business model: implications for firm performance", Strategic Management Journal, 29(1), 2008, pp. 1–26.

[26] Lambert, S., "The Importance of Classification to Business Model Research", 2015.

[27] Sneath, P.H.A. and R.R. Sokal, Numerical taxonomy: The principles and practice of numerical classification, Freeman, San Francisco, 1973.

[28] Hambrick, D.C. and P.A. Mason, Upper echelons: The organization as a reflection of its top managers, [s.n.], [S.l.], 1984.

[29] Ketchen, D.J. and C.L. Shook, "The application of cluster analysis in strategic management research: An analysis and critique", Strategic Management Journal, 17(6), 1996, pp. 441–458.

[30] Milligan, G.W., Cluster analysis, College of Business, Ohio State University, Columbus, Ohio, 1995.